

REMARKS/ARGUMENTS

In view of the following remarks, Applicant respectfully requests reconsideration and allowance of the subject application. No claims are amended. No new claims are added. No claims are cancelled. Claims 14, 10-19 and 21-26 are pending and in condition for allowance. Applicant respectfully requests that this response be entered and the claims furthered to issuance. This response is believed to be fully responsive to all issues raised in the 9/17/04 Final Office Action.

§103 REJECTIONS

Claim 4 stands rejected under §103 as being unpatentable over Japanese Patent JP-A-H11-198387 to Fujikawa hereinafter referred to as “Fujikawa” in view of US Patent No. 6,113,225 to Miyata hereinafter referred to as “Miyata”.

Claim 4 recites a method of fabricating a slot in a print head substrate, comprising:

- dry etching through a first surface of the substrate having a thickness between the first and a second opposing surfaces, wherein said dry etching removes about 50 percent of the thickness of the substrate; and,
- sand drilling through the second surface of the substrate effective to form, in combination with said etching, a slot at least a portion of which passes entirely through the thickness of the substrate.

Fujikawa relates to a two step slotting method developed due to perceived deficiencies with traditional anisotropic slot forming techniques. Paragraph 8 relates to the problem to be solved by the invention and states “in the conventional method (of slot formation), the ink feed hopper 9 (or slot) is usually
5 processed by anisotropic etching. Fujikawa goes on in paragraph 8 to state that “this anisotropic etching has risk of affecting the electrode wiring layer 4 and a nozzle wall” and that “the repeatability of processing is low and etches near the liquid route 8 side.” Fujikawa continues in paragraph 8 and into paragraph 9 that variation in repeatability of such etches is inconsistent. Paragraph 9 continues
10 that such inconsistent etching can produce inadequate or uneven fluid flow to the firing chambers and/or lead to damage to various components on the thin-film surface such as to the electrode wiring layer.

To overcome these shortcomings, Fujikawa describes etching a shallow precisely positioned trench in the thin film side of the substrate and utilizing a
15 second removal process such as sandblasting from the opposite side of the substrate to intersect the trench to form a slot. This process avoids potential problems at the thin film surface and with associated thin film features. Fujikawa specifically utilizes a shallow trench to avoid the noted shortcomings of etching the slot, namely the “risk of affecting the electrode wiring layer 4 and
20 a nozzle wall” and “the repeatability of processing is low and etches near the liquid route 8 side.” There is no suggestion in Fujikawa that deeper etching may also reduce these problems. There is no motivation in Fujikawa to try increased

trench depth. Conversely, Fujikawa teaches directly away from “wherein said dry etching removes about 50 percent of the thickness” as recited in claim 4 by expressly teaching “etching a shallow precisely positioned trench” to avoid the shortcomings of the art.

5 The Office states that Fujikawa does not disclose or teach “that the dry etching removes about 50% of the thickness of the substrate.” The Office looks to Miyata for suggestions for such slot forming techniques. Specifically, the Office asserts that “Miyata et al teach a process for forming an opening or trench having a depth that is about 50% or half of the substrate thickness by conducting
10 half etching of the silicon substrate in order to form opening with high accuracy (col. 11, lines 60- col. 12 lines 14).”

 The cited text of Miyata relates to forming nozzle openings and recites in pertinent part “the nozzle opening 111 is formed when half-etching is conducted on the single crystal silicon base plate.” (emphasis added) Col 12 lines 2-3.
15 Nozzle openings are not analogous to the ink feed hopper of Fujikawa and as such one of skill in the art would not have looked to nozzle opening formation techniques to combine with Fujikawa. To the contrary, Fujikawa expressly states that one motivation for their ink feed hopper formation technique was to avoid the “risk of affecting the electrode wiring layer 4 and a nozzle wall”. As such,
20 Fujikawa expressly distinguishes its ink feed hopper from a nozzle opening. Therefore, there is no motivation to combine Fujikawa and the cited teachings of

Miyata as suggested by the Office. Applicant respectfully requests that the §103 rejection of claim 4 be withdrawn.

Claims 10-15, 17-19 and 21-26 are rejected under §103 as being
5 unpatentable over Japanese Patent JP-A-H11-198387 to Fujikawa hereinafter referred to as “Fujikawa” in view of US Patent No. 6,139,132 to Yasukawa hereinafter referred to as “Yasukawa”.

Claim 21 relates to a method of forming slots in a semiconductor substrate having first and second opposing surfaces comprising:

- 10 • dry etching a first trench through the first surface of the substrate; and,
- creating a second trench through the second surface of the substrate effective to form, in combination with the first trench, a slot at least a portion of which passes entirely
15 through the substrate, wherein the maximum width of the slot is less than or equal to about 50 percent of the thickness of the substrate.

Fujikawa describes etching a shallow precisely positioned trench in the
20 thin film side of the substrate and utilizing a second removal process such as sandblasting from the opposite side of the substrate **to intersect the trench rather than the thin film surface and associated thin film features.** This technique utilizes the second substrate removal process to remove the majority of the substrate material.

The office recognizes that Fujikawa does not teach or suggest the limitations of claim 21 and looks to Yasukawa for these limitations. Specifically, the Office looks to Yasukawa to teach “a method of making through hole or slot, Yasukawa et al teach that the maximum width of a slot (41) to be made as small
5 as possible and the through-hole is formed for smoothly passing a fluid like ink and thereby, air bubbles is prevented. (see col. 8, lines 1-28).” Applicant respectfully notes that pressurizing chamber 41 and associated nozzle communicating hole are analogous to the nozzles- i.e. nozzle walls that Fujikawa sought to protect during formation of the ink feed hopper. Nozzle openings are
10 not analogous to the ink feed hopper of Fujikawa and as such one of skill in the art would not have looked to nozzle opening formation techniques to combine with Fujikawa. To the contrary, Fujikawa expressly states that one motivation for their improved ink feed hopper formation technique was to avoid the “risk of affecting the electrode wiring layer 4 and a nozzle wall”. As such, Fujikawa
15 expressly distinguishes its ink feed hopper from a nozzle opening. Therefore, there is no motivation to combine Fujikawa and the cited teachings of Yasukawa as suggested by the Office.

Even assuming arguendo that Yasukawa’s pressurizing chamber 41 is analogous to Fujikawa’s ink feed hopper there is no motivation to combine the
20 references. The Office asserts that Yasukawa teaches “a method of making through hole or slot, Yasukawa et al teach that the maximum width of a slot (41) to be made as small as possible and the through-hole is formed for smoothly

passing a fluid like ink and thereby, air bubbles is prevented.” However, Applicant respectfully notes that Fujikawa does not teach, suggest, or hint that its ink feed hopper suffers from ink starvation or bubble issues of any kind. The Office has provided no motivation whatsoever why one skilled in the art who
5 was aware of the teachings of Fujikawa would look to Yasukawa. Further, assuming arguendo that one of skill in the art would look to combine the two references, Fujikawa still teaches away from the combination for two reasons. First, Yasukawa teaches utilizes a single etching process to form the feature, which is exactly what Fujikawa found problematic. Second, etching the first
10 trench of Fujikawa deeper goes against its express teachings. When Fujikawa found fault with utilizing a single etch step to form the ink feed hopper, they expressly teach “etching a shallow precisely positioned trench to a first shallow trench to reduce the damage”.

For at least these reasons, Applicant respectfully requests that the §103
15 rejection of claim 21 based upon Fujikawa and Yasukawa be withdrawn.

Claims 22-26 depend from allowable claim 10 and are similarly allowable.

20 **Claims 10-15 and 17-19** recite limitations similar to those described above in relation to claim 21 and are similarly allowable.

Provisional Double Patenting rejection

Applicant acknowledges the provisional double patenting rejection over a patent application to Rivas et al having Serial No. 10/061828 (hereinafter “Rivas”). Applicant confirms that the present application and Rivas were, at the
5 time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

Conclusion

Claims 4, 10-19 and 21-26 are believed to be in condition for allowance. Applicant respectfully requests reconsideration and prompt issuance of the present application. Should any issue remain that prevents immediate issuance of the application, the Examiner is encouraged to contact the undersigned attorney to discuss the unresolved issue.

Respectfully Submitted,
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